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Mathematics for below-average achievers was discussed. The complete report is published under separate cover -- Appendix A. The report of a follow-up conference of an ad hoc committee recommends that experimental materials be prepared in the summer of 1965 for elementary groups, junior high groups and technical vocational programs to aid in providing a more efficient mathematics program.

Two mathematicians were added to a writing team of the School Mathematics Study Group for an eight-week writing session in the summer of 1964. The program was not completely successful.

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FINAL REPORT

I. Conference on Mathematics Education For Below Average Achievers

II. Writing Experience for Potential Textbook Authors Through Participation In a Group Writing Project

COOPERATIVE RESEARCH PROJECT

No. F-037

EDWARD G. BEGLE

STANFORD UNIVERSITY, STANFORD, CALIFORNIA

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FINAL REPORT

I. CONFERENCE ON MATHEMATICS EDUCATION FOR BELOW AVERAGE ACHIEVERS

II. WRITING EXPERIENCE FOR POTENTIAL TEXTBOOK AUTHORS THROUGH PARTICIPATION IN A GROUP WRITING PROJECT

Cooperative Research Project #F-037

Edward G. Begle

STANFORD UNIVERSITY, STANFORD, CALIFORNIA

1964

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FINAL REPORT

Two separate activities were carried out in this project, and this report is accordingly presented in two sections.

SECTION I

A conference on mathematics education for below average achievers was held on April 10 and 11, 1964. The conference had two purposes. The first was to provide a representative cross section of the mathematical community with some information on the psychological and sociological problems involved in the teaching of mathematics to various kinds of students who are below average in achievement.

The second purpose was to give the conference participants an opportunity to suggest specific action and research programs which might be undertaken, either by the School Mathematics Study Group or by others.

A list of the conference speakers and participants, as well as texts of the talks given, will be found in Appendix A (bound separately). Also in this Appendix are the recommendations made for future action.

As a follow-up to this conference, an ad hoc committee met on May 23 to review the recommendations made at the conference and suggest specific projects that SMSG might undertake immediately. Minutes of this meeting are found in Appendix B. (Recommendation A is currently being implemented by SMSG with NSF funds and plans for implementation of Recommendation B are being studied.)

SECTION II

Two mathematicians from small liberal arts colleges were added to an SMSG writing team for an eight-week writing session in the summer of 1964. This writing team was charged with the preparation of a preliminary version of a calculus text explicitly designed for use in high school.

The two individuals in question would probably not have been asked to participate had not contract funds been made available for this purpose. The object of this experiment was to see if active participation in such a curriculum project might not eventually result in continued work of this sort by these individuals.

These two mathematicians functioned as full fledged members of the writing team and were given the same tasks and responsibilities as all the other members.

At the end of the summer they were each asked for a brief report. In order to focus their comments they were asked if, as a result of the summer's experience, they were more inclined toward writing a calculus text than they had been at the beginning of the summer.

The two reports are to be found in Appendix C. Inspection of these two reports indicates that the experiment had not been particularly successful. On the positive side, however, it is clear that the summer did provide the two participants with information, not otherwise obtainable, on which a sound decision as to involvement in curriculum development work could be based. In addition, should either of the two engage in text writing in the future, the product will probably be of much higher quality than it would have been without this experience.

APPENDIX B

Ad Hoc Committee on Below Average Achievers in Mathematics

An ad hoc committee met in Chicago on May 23 to review the recommendations of the April Conference on Below Average Achievers in Mathematics. Those attending were: Florence Elder, Wade Ellis, Kirk Fort, Lenore John, Irene Sauble, and J. F. Weaver. SMSG Headquarters was represented by E. G. Begle, M. E. Dunkley, and Gloria Leiderman.

The committee was asked to recommend specific projects for SMSG to undertake in the immediate future. The committee recommended that experimental materials be prepared in the summer of 1965 of the following kinds:

1. At the kindergarten and first grade level: Materials for teachers emphasizing techniques for providing disadvantaged children with the experiences necessary for the formation of the fundamental concepts of arithmetic.

2. For the grades from 3 or 4 to 7 or 8: Materials for students in which the conceptual aspects of mathematics are sharply separated from the computational, with the expectation that the rates at which a student will progress in the two areas will be quite independent.

3. For seventh grade (and perhaps fourth grade) students: Material which reviews from a different point of view the mathematics previously studied. New materials prepared for earlier grades may be rewritten with illustrations and problems appropriate to the seventh (fourth) grade.

4. For junior high school students (and perhaps others): Materials which relieve the students from the burden of computation as much as possible, by providing slide rules, books of tables, pocket computers, etc.

5. For students in technical vocational programs: Sets of texts, all with the same core of mathematics but with the illustrations and problems in each text relevant to a particular vocation.

In order to prepare for the summer of 1965, the committee recommends:

A. The establishment, in appropriate schools, of "observation points" which will help to provide some of the information needed for the first project above.

B. A study, perhaps by means of one or more conferences, of the mathematics programs for the training of technicians.

The committee also recommends close liaison and cooperation with other groups with similar interests.

APPENDIX C

I

Allow me to express my appreciation to you for the opportunity to participate in the Calculus writing project sponsored by the School Mathematics Study Group. It has been a pleasure to work with a group of mathematicians from different sections of the country and to gain from the experience. It has been especially helpful to me since it is the first opportunity I have had to concentrate on writing for any length of time and I am confident it will have a decided effect upon my teaching and my association with others in the academic profession.

My experience as a member of the writing team has been both enlightening and frustrating. I have learned about many of the problems associated with the writing of an elementary calculus book and they could in themselves discourage most of us who are relatively inexperienced in such efforts. On the basis of this experience alone, I would not attempt to write an entire calculus book without assistance. On the other hand, I have also developed some ideas of my own which I would like to see attempted in a calculus text for high schools and with added writing experience, I would welcome the opportunity to put those ideas into such a project.

In retrospect, I realize that I had so very much to learn about the problems involved and that there is much more to be learned. This leads to discouragement but it also breeds hope that someday enough experience will be gained so that I will attempt such a project.

Below are listed my own reactions to the Calculus writing project and I hope they will be of assistance to you in your evaluation of the summer writing session.

1. High standards set by committee demanded perfection.

2. Friendly and cooperative attitude of members.

3. Stabilizing advice from High School teachers
   a. Kept reactions of teachers and students before us.

4. Excellent mathematical ability of other members.

5. Writing styles and ideas differed widely.

II

The professional environment in the calculus writing group was new to me. The daily contact with high caliber professional mathematicians and outstanding high school teachers will have a lasting effect on my attitudes and thoughts.

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The main objective of the writing group -- an honest, mathematically rigorous text which is stimulating and practically self-teaching -- is not sufficiently different to be impressive; however the imaginative discourse, the high standard of elegance (mostly behind the scenes), and some of the bold innovations are impressive. Since the text is experimental, the writing group has more opportunity than the usual author to depart from traditional and accepted modes. I am now vividly aware of the problems associated with innovation and the remarkably high resistance Mathematician A has to the ideas of Mathematician B.

As a result of my writing efforts and my criticism of the writing of others I am more aware of the technical difficulties associated with content, order, and style. I now recognize that pedagogical reasons may hold sway in deciding between a formal, precise mathematical expression and a less efficiently presented statement in prose. An effective, consistent style of communication which is suitable for a textbook is no accident. Ordinary mortals need practice to cultivate it.

How did this summer experience affect my attitude toward textbook writing? As a result of my work this summer I formed two definite impressions. For those who have strong, fixed ideas of style and content a random collaboration is highly unsatisfactory. The magnitude and difficulty of the task one undertakes in writing an acceptable textbook is far greater than I had realized.

Almost every teacher at one time or another has the definite impression that he can write a book which would be much better than those available on the market. I have entertained such an impression. The only justification I can advance to support the writing of another book in calculus is that the author be able to present distinctly superior mathematics at this level in a fresh and interesting manner. Alas, my summer experience has given me little reason to believe I can accomplish this; therefore I have no plans at present to write a calculus textbook. I cannot truthfully say that I have no intention of ever attempting to write any textbook. There is the always present, gnawing dissatisfaction with the texts available, the strong desire to have a text which more closely reflects one's own point of view, and the (vain) hope that one's effort may be a contribution to mathematics education. At some time in the future I may succumb to temptation. If I do, the experience in writing this summer will be invaluable.

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